

## PATENT COOPERATION TREATY

## PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY  
(Chapter II of the Patent Cooperation Treaty)

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## (PCT Article 36 and Rule 70)

Applicant's or agent's file reference MIW/SS/41829	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/GB2004/001140	International filing date (day/month/year) 18.03.2004	Priority date (day/month/year) 18.03.2003
International Patent Classification (IPC) or national classification and IPC A24C5/34		
Applicant MOLINS PLC et al.		
<p>1. This report is the International preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> <i>(sent to the applicant and to the International Bureau) a total of 14 sheets, as follows:</i></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</li> <li><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</li> </ul> <p>b. <input type="checkbox"/> <i>(sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</i></p> <p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Box No. I Basis of the opinion</li> <li><input type="checkbox"/> Box No. II Priority</li> <li><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li><input type="checkbox"/> Box No. IV Lack of unity of invention</li> <li><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li><input type="checkbox"/> Box No. VI Certain documents cited</li> <li><input type="checkbox"/> Box No. VII Certain defects in the international application</li> <li><input type="checkbox"/> Box No. VIII Certain observations on the international application</li> </ul>		
Date of submission of the demand 14.10.2004	Date of completion of this report 16.06.2005	
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epru d Fax: +49 89 2399 - 4465	Authorized Officer  Marzano Monterosso, Telephone No. +49 89 2399-2902	



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2004/001140

**Box No. I Basis of the report**

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
  - This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
    - international search (under Rules 12.3 and 23.1(b))
    - publication of the international application (under Rule 12.4)
    - international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the elements\* of the international application, this report is based on (replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):

**Description, Pages**

1, 2, 7-13, 15-31, 33-35	as originally filed
4-6, 14, 14a, 14b, 32	received on 07.01.2005 with letter of 05.01.2005
3	received on 20.05.2005 with letter of 16.05.2005

**Claims, Numbers**

4 (part), 5-16, 17 (part), 22 (part), 23-27	received on 07.01.2005 with letter of 05.01.2005
1-3, 4 (part), 17 (part), 18-21, 22 (part)	received on 20.05.2005 with letter of 16.05.2005

**Drawings, Sheets**

1/10-10/10	as originally filed
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a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3.  The amendments have resulted in the cancellation of:
  - the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (specify):
  - any table(s) related to sequence listing (specify):
4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
  - the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (specify):
  - any table(s) related to sequence listing (specify):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2004/001140

**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims	1-27
	No: Claims	
Inventive step (IS)	Yes: Claims	1-27
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-27
	No: Claims	

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1 Reference is made to the following documents:

D1: EP-A-0 880 020 (JAPAN TOBACCO INC) 25 November 1998 (1998-11-25)  
D2: EP-A-0 581 596 (JAPAN TOBACCO INC) 2 February 1994 (1994-02-02)

2 Document D1, which is considered to represent the most relevant state of the art, discloses (cf. col. 11, l. 57 - col 12, l. 23) an ignition system for a smoking machine from which the subject-matter of claim 1 differs in that the parameters of the operation of the heat source are adjusted depending on the position if the end of the smoking article, such as to enable successful ignition of said end by said heat source.

In fact in the system according to D1 the adjustment is performed on the position of the heating head and not on its parameters of operation, in order to ensure successful ignition of the smoking article.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

3 The problem to be solved by the present invention may be regarded as how to provide an ignition system which does not require very accurate actuating mechanisms for moving the heating source and is thus more simple and less expensive.

4 The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons: none of the documents of the prior art discloses a system where the parameters of operation of the heating source are adjusted depending on the position of the end of the smoking article with respect to the heating head .

In fact, document D2 simply discloses a system where the cigarette end position is detected and memorised and used when lighting the cigarette.

5 Similar reasoning applies to the subject matter of independent claim 22, at least for the case in which the parameters of operation of the heating head are adjusted according to the position of the end of the smoking article.

In the case where the relative position between heating head and end of smoking article is adjusted, the subject matter of claim 22 differs from the disclosure of D1 in that the sensor is arranged to detect radiation reflected from or emitted by the smoking article.

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(SEPARATE SHEET)**

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Said alternative solution of detecting the end of the smoking article not being present in any of the documents of the available prior art, the subject matter of claim 22 is also considered to involve an inventive step (Article 33(3) PCT).

- 6 The same reasoning applies for the smoking machine according to claim 25, which comprises an ignition system according to any of the claims 1-24.
- 7 Claims 2-21, 23-24 and 26-27 are dependent on claims 1, 22 and 25 respectively and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Various attempts have been made to address this problem. According to one method, individual cigarettes are adjusted by hand following insertion into the smoking machine, such that each cigarette protrudes by a predetermined distance from the machine. This method successfully achieves uniform positioning of cigarettes within the smoking machine for the purposes of ignition, but is time-consuming and inefficient. Attempts have also been made to design lighter tools which are capable of reliably lighting cigarettes over a range of distances varying by several millimetres. Although the benefits of automation are preserved, such tools however have costly power requirements in operation, and may cause heat damage to cigarettes.

There remains therefore a need for an improved apparatus for automatically and reliably lighting cigarettes for smoking by a smoking machine.

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15 According to one aspect of the present invention therefore, there is provided an ignition system for a smoking machine, comprising a heat source that is adapted for emitting heat for igniting one end of a smoking article which is held by a smoking machine; an automatic sensor which is adapted for detecting the position of said end of the smoking article; and control means in communication with said sensor, which are adapted for automatically adjusting a parameter of the operation of said heat source depending on the position of said end as detected by said sensor, such as to enable successful ignition of said end by said heat source.

20

25 According to another aspect of the present invention, there is provided a smoking machine comprising holding means for holding a smoking article such as to expose one end thereof, puffing means positioned adjacent the other end of the

smoking article for drawing air through the smoking article, and an ignition system in accordance with the invention for igniting said one end of the smoking article such that the article can be smoked by the smoking machine.

5 In use of the present invention, the sensor acts to detect the position of the end of the smoking article, and communicates information in this regard to the control means. Based on this information, the control means makes automatic adjustments as necessary to the operation of the heat source, such as to enable successful ignition of the smoking article by the heat source. Successful ignition 10 may denote ignition at the first or the second, preferably the first, attempt. Furthermore, successful ignition may denote ignition of the smoking article without any undesired heat damage to the article and/or without contact between the smoking article and the heat source during emission of heat by the heat source.

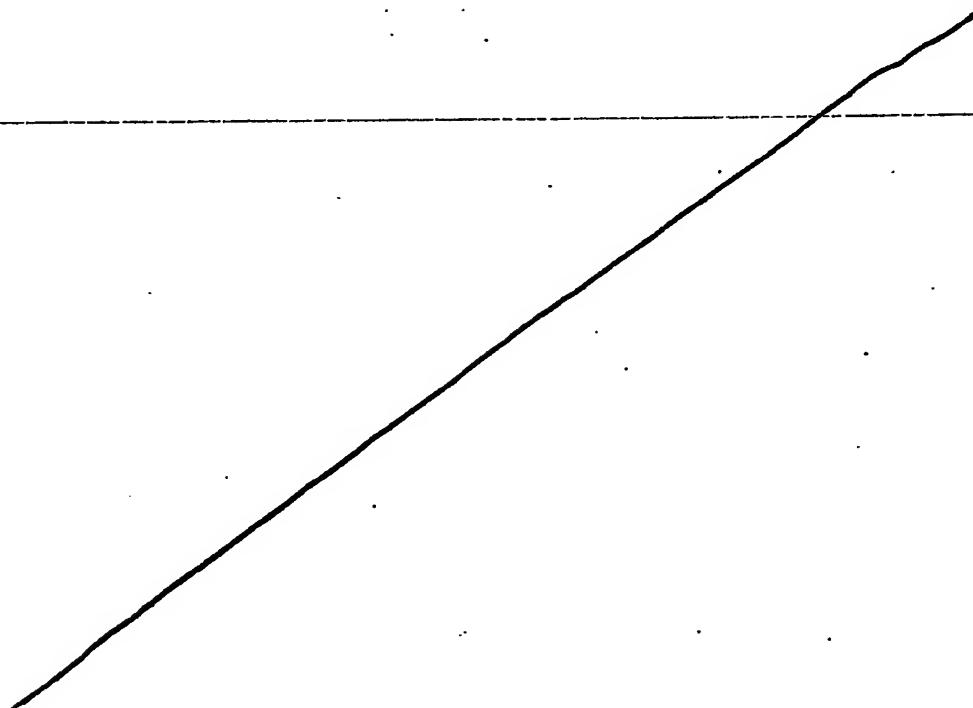
15 Said ignition system may be adapted for igniting a plurality of smoking articles. Thus, said ignition system may comprise a plurality of heat sources, each of which is associated with a respective automatic sensor in the manner hereinbefore described.

20 It will be understood that the heat source may emit heat for igniting the end of said smoking article by conduction, by convection or by radiation, or by any combination of conduction, convection and radiation. More typically, said heat source may emit heat by radiation or convection or by a combination of radiation 25 and convection. Said heat source may, for example, comprise a heatable coil, plate, element or other surface, such as a resistive coil, resistive plate, or other resistive heating element or surface heated thereby. Such a heat source will emit

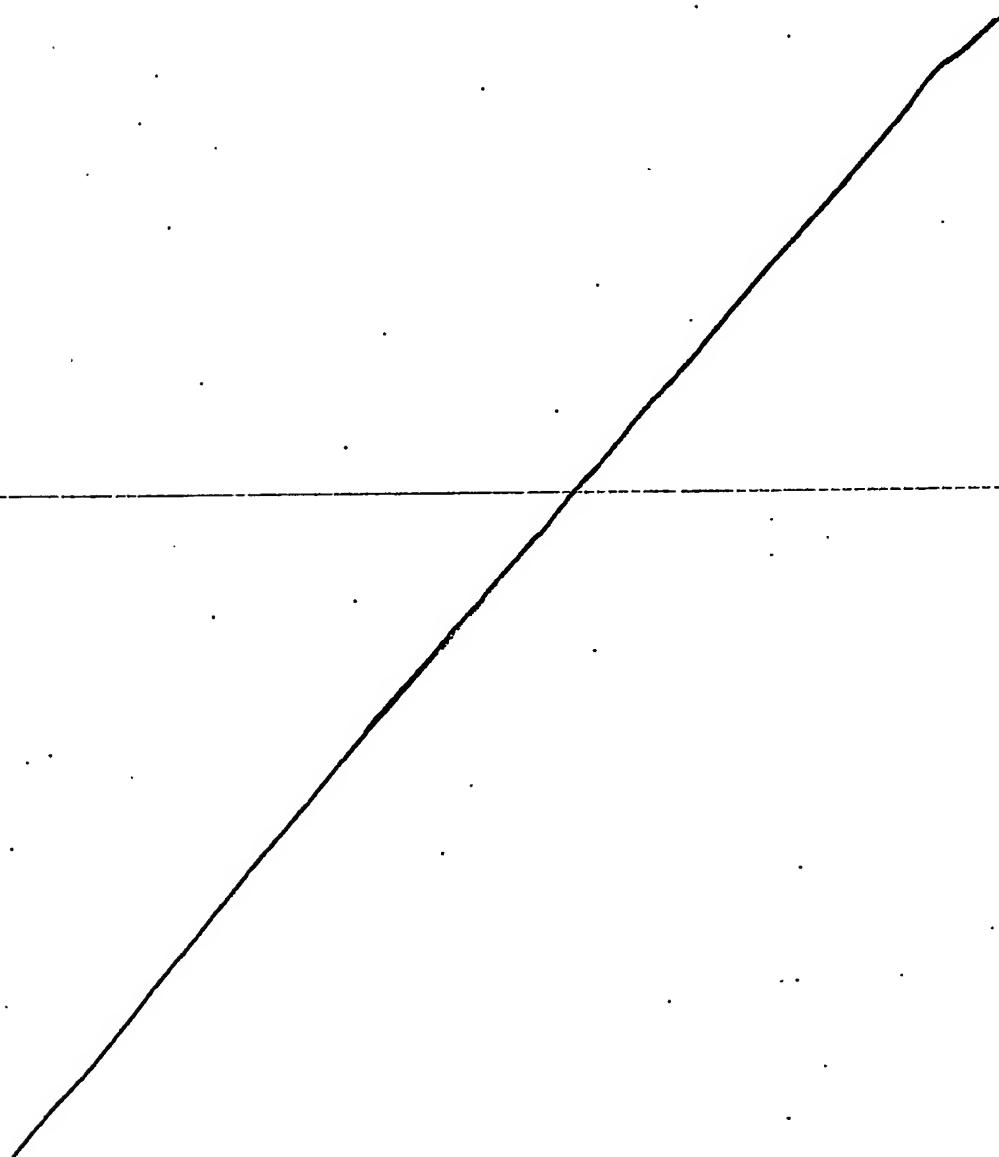
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heat for igniting the end of said smoking article by a combination of electromagnetic radiation and convection of heated air. The power of said heat source may be in the region of 30-100W, such as between 40-60W, such as about 50W. Alternatively, said heat source may comprise a laser, or an incandescent bulb such as a halogen bulb, for example a halogen bulb of about 120-200W, which will emit heat for igniting the end of said smoking article primarily by electromagnetic radiation. Heat sources of all of these types are known in the art. Said heat source may conveniently be powered by electricity.

10 As will be appreciated by the skilled man, once the location of the end of the smoking article has been accurately determined, a variety of adjustments may be made to the components of the ignition system and/or the smoking machine so as to ensure successful ignition of the smoking article by the ignition system.



5 Parameters of the operation of the heat source which may affect the reliability and success of ignition include the temperature of the heat source; the channelling of heat from the heat source to the end of the smoking article; the level and wavelength range of electromagnetic



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heat to the end of a smoking article just prior to the start of the puffing phase. This will permit pre-heating of the end which will "prime" the end for ready ignition at the start of the puffing phase.

5 Hence, said control means may be arranged to be operatively connected to a smoking machine such as to detect and monitor the timing of the puff cycle, and may be arranged to control the relative timings of the initiation of application of heat from the heat source to the end of the smoking article and the start of the puff cycle, in order to ensure successful ignition of said end. Said control means may therefore be arranged to control the timing of the initiation of application of heat from the heat source to the end of the smoking article, and/or the timing of the start of the puff cycle, whereby the relative timings of these events may be controlled.

15 The distance separating said heat source from said end of the article during emission of heat from the heat source is typically a key parameter affecting the reliability and success of ignition, regardless of the manner in which heat is emitted by the heat source. Thus, said control means may be adapted to automatically adjust relative movement of said heat source and/or said smoking article, such that a predetermined distance separates said heat source from said end of the smoking article, whereby said end of the smoking article can be successfully ignited by the heat source.

25 Suitably, therefore, said heat source may be capable of movement with respect to said smoking article, and said control means may be adapted for controlling movement of said heat source, whereby the heat source under the control of said control means can be moved into or halted at a selected position. Alternatively, or in addition, said control means may be adapted for controlling movement of a

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smoking article held by a smoking machine, whereby said smoking article under the control of said control means can be moved into or halted at a selected position. By thus controlling relative movement of said heat source and/or said smoking article in view of the known position of said end of the smoking article, 5 a predetermined distance separating said heat source from said end of the smoking article may readily be achieved.

Said sensor may be arranged such as to detect the end of a smoking article when said end is disposed at said predetermined distance from the heat source, or when 10 said end is positioned such that after subsequent movement of said smoking article and/or said heat source along a pre-set locus, said end will be disposed at said predetermined distance from the heat source. Alternatively, said ignition system may be arranged such that following detection of said end of the smoking article by said sensor, said heat source and/or said smoking article are moved 15 under the control of the control means such as to achieve said predetermined distance between said heat source and said end of the smoking article.

Suitably, said control means may be adapted to ensure that said heat source and 20 said smoking article remain out of contact with one another during emission of heat by the heat source.

In some preferred embodiments, said sensor may be fixed in a known position with respect to said heat source, and may be adapted for detecting said end of the smoking article when said end is in a desired position with respect to said heat source, and for transmitting a detection signal to said control means. Thus, said 25 heat source and said sensor may be movable with respect to said smoking article, and said control means may be adapted for terminating movement of said heat source and said sensor with respect to said smoking article on receipt of said

14b.

5 detection signal from said sensor. In this case, the sensor may be conceptualised as "hunting" for the end of the smoking article. Alternatively or in addition, said smoking article may be movable with respect to said heat source and said sensor, and said control means may be adapted for terminating movement of said smoking article with respect to said heat source and said sensor on receipt of said detection signal from said sensor. In this case, the smoking article may be conceptualised as "probing" for the sensor.

control hardware (not shown).

The ignition system comprises a sensor 25 which is adapted to take one or more measurements for determining the distance between the end of a smoking article 5 30 within a holder 31 for use in a smoking machine, and a known point on the holder. Thus, the sensor 25 may be adapted to be positioned on or adjacent a smoking machine. Said sensor 25 is adapted to communicate with said control hardware and to transmit to said control hardware information regarding said measurement. Said sensor may, for example, comprise a range-finding sensor 10 such as a laser sensor.

The control hardware of the ignition system is adapted for processing said information, and for making adjustments to the position and orientation of the ignition head 2, such that when the holder and smoking article have been 15 installed in the smoking machine, and the ignition system and/or holder have been moved by the smoking machine into proximity with one another, the ignition head is positioned at a predetermined distance from the end of the smoking article protruding from the holder.

20 In knowledge of the position of the end of a smoking article, having been detected by a sensor as hereinabove described, adjustments can also or instead be made by the control hardware to the operation of the resistive coil, whereby the success of ignition may be improved.

**CLAIMS**

1 An ignition system for a smoking machine, comprising a heat source  
5 that is adapted for emitting heat for igniting one end of a smoking article  
which is held by a smoking machine; an automatic sensor which is adapted  
for detecting the position of said end of the smoking article; and control  
means in communication with said sensor, which are adapted for  
automatically adjusting a parameter of the operation of said heat source  
10 depending on the position of said end as detected by said sensor, such as to  
enable successful ignition of said end by said heat source.

2 An ignition system as claimed in claim 1, wherein said heat source is  
adapted for emitting heat by air convection for igniting said end of the  
15 smoking article, and said control means is adapted to automatically adjust the  
temperature of the heat source, the adjustment depending upon the location  
of said end, as detected by the sensor.

3 An ignition system as claimed in claim 1 or claim 2, wherein said  
20 control means is adapted to adjust the channelling of heat from said heat  
source to said end of the smoking article, by selectively dispersing heat away  
from the end of the smoking article and/or selectively directing heat towards  
the smoking article, as required.

25 4 An ignition system as claimed in any of claims 1-3, wherein said heat  
source is adapted for emitting heat for igniting said end of the smoking  
article by electromagnetic radiation, and said control means is adapted for  
automatically adjusting the level and/or the wavelength range of  
electromagnetic radiation that is applied by the heat source to the end of the

smoking article for igniting the article, the adjustment depending upon the position of said end as detected by the sensor.

5 An ignition system as claimed in claim 4, wherein said control means  
5 is adapted for automatically adjusting the level and/or the wavelength range  
of electromagnetic radiation that is emitted from the heat source.

6 An ignition system as claimed in claim 4 or claim 5, wherein said  
control means is adapted for adjusting the level and/or the wavelength range  
10 of electromagnetic radiation that is transmitted from the heat source to the  
end of the smoking article.

7 An ignition system as claimed in claim 6, wherein said control means  
is adapted for adjustably shielding and/or obscuring said heat source from  
15 said end of the smoking article, and/or for selectively focusing radiation  
emitted by said heat source onto said end, and/or for selectively deflecting  
radiation emitted by said heat source away from said end.

8 An ignition system as claimed in claim 7, wherein said control means  
20 includes adjustable shield means which can be positioned and adjusted in  
order to shield a selected area of the heat source from the end of the  
smoking article, and/or adjustable reflecting and/or refracting means which  
are adapted to selectively focus or direct radiation emitted from the heat  
source towards said end of the smoking article, and/or adjustable refracting  
25 and/or deflecting means which are adapted to selectively direct radiation  
emitted from the heat source away from the end of the smoking article.

9 An ignition system as claimed in claim 7 or claim 8, wherein said  
control means comprises at least one thermal filter, which thermal filter is

adapted to absorb or reflect a proportion of radiation impinging on the filter, which thermal filter is arranged to be removably positioned between said heat source and the end of the smoking article such as to prevent the transmission of a proportion of radiation emitted from said heat source towards said smoking article.

10 An ignition system as claimed in claim 9, wherein said control means comprises one or more variable or dichroic filters, each variable or dichroic filter including a plurality of discrete areas with different absorption/reflection characteristics, such that by positioning the variable or dichroic filter between the heat source and the end of the smoking article and moving the variable or dichroic filter relative to the heat source and the smoking article, the quantity of electromagnetic radiation transmitted from the heat source to the smoking article may be adjusted as required.

15

11 An ignition system as claimed in any preceding claim, wherein said control means is adapted to automatically adjust the time for which heat is applied to the end of the smoking article for igniting the article, depending upon the location of said end.

20

12 An ignition system as claimed in any preceding claim, wherein said control means is adapted to automatically adjust the timing of the application of heat with respect to the puff cycle of a smoking machine, depending upon the position of said end of the smoking article as detected by the sensor.

25

13 An ignition system as claimed in any of the preceding claims, wherein said control means is further adapted to automatically adjust relative movement of said heat source and/or said smoking article, such that a predetermined distance separates said heat source from said end of the 5 smoking article, whereby said end of the smoking article can be successfully ignited by the heat source.

14 An ignition system as claimed in claim 13, wherein said heat source is capable of movement with respect to said smoking article, and said control 10 means is adapted for controlling movement of said heat source, whereby the heat source under the control of said control means can be moved into or halted at a selected position.

15 An ignition system as claimed in claim 13 or claim 14, wherein said 15 control means is adapted for controlling movement of a smoking article held by a smoking machine, whereby said smoking article under the control of said control means can be moved into or halted at a selected position.

16 An ignition system as claimed in any of claims 13-15, wherein said 20 sensor is arranged to detect the end of a smoking article when said end is disposed at said predetermined distance from the heat source, or when said end is positioned such that after subsequent movement of said smoking article and/or said heat source along a pre-set locus, said end will be disposed at said predetermined distance from the heat source.

25 17 An ignition system as claimed in any of claims 13-16, which ignition system is arranged such that following detection of said end of the smoking article by said sensor, said heat source and/or said smoking article are moved under the control of the control means such as to achieve said predetermined

distance between said heat source and said end of the smoking article.

18 An ignition system as claimed in any of claims 13-17, wherein said sensor is adapted for determining when the end of said smoking article is in 5 said predetermined position.

19 An ignition system as claimed in any preceding claim, wherein said sensor is adapted for identifying the position of said end of the smoking article amongst a range of possible positions.

10

20 An ignition system as claimed in any preceding claim, wherein the arrangement is such that said end of the smoking article can be selectively shielded from said heat source, such as to prevent substantial transfer of heat from said heat source to said end.

15

21 An ignition system according to any of the preceding claims, wherein the sensor is arranged to detect radiation reflected from or emitted by the smoking article.

20 22 An ignition system for a smoking machine, comprising a heat source that is adapted for emitting heat for igniting one end of a smoking article which is held by a smoking machine; an automatic sensor which is adapted for detecting the position of said end of the smoking article; and control means in communication with said sensor, which are adapted for

25 automatically adjusting a parameter of the operation of said heat source and/or for automatically adjusting relative movement of said heat source and/or of said article, depending on the position of said end as detected by said sensor, such as to enable successful ignition of said end by said heat source, wherein the sensor is arranged to detect radiation reflected from or 30 emitted by the

smoking article.

23 An ignition system according to claim 21 or 22, wherein said sensor comprises a range finding sensor which is adapted to transmit signals which are able to be reflected from a target, to detect signals reflected from said target, and to analyse said reflected signals.

24 An ignition system according to claim 21 or 22, wherein said sensor comprises a camera type device which is capable of visualising the smoking 10 article.

25 A smoking machine comprising holding means for holding a smoking article such as to expose one end thereof, puffing means positioned adjacent the other end of the smoking article for drawing air through the smoking 15 article, and an ignition system in accordance with any of claims 1-24 for igniting said one end of the smoking article such that the article can be smoked by the smoking machine.

26 A smoking machine as claimed in claim 25, which machine is 20 capable of holding a plurality of smoking articles, and said lighting system is adapted for igniting each of said smoking articles consecutively.

27 A smoking machine as claimed in claim 25 or claim 26, which machine is adapted for moving each smoking article which is to be ignited to 25 a position such that the end of the smoking article is within a small distance, such as to within a few centimetres or a few millimetres, of said ignition head, prior to detection of said end by the sensor and consequent adjustment of the ignition head and/or the position of the smoking article.